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ABSTRACT

Rural schools typically face multiple challenges related to providing educational opportunities for students and staff. A comparison of curricular offerings in English, foreign languages, and mathematics in a Chicago suburban high school, a rural high school district, and a small rural unit district reveals the curricular disadvantages of small rural high schools. This newsletter reports on how eight schools and one intermediate educational service unit in Illinois have utilized technology to improve educational opportunities and expand curricular offerings. The schools were identified by technology consultants in Illinois Educational Service Centers as making effective use of educational technology. The schools are not all rural, but were chosen as models that can be replicated in rural settings. Each case study includes a program description, examines technology resources, addresses future directions, and provides the name and address of a contact person. A common denominator in the case studies was that one individual was the driving force behind the technology integration process. In most schools, there was no technology plan in place, and schools appeared to "wing it" when adopting the use of educational technology. In most cases, the only evaluation was anecdotal in nature, and frequently hardware was purchased with no thought as to how to use the technology. It is suggested that schools follow a three-step process in implementing technology: (1) conduct a district technology needs assessment focusing on current practice and desired practice; (2) develop a technology implementation plan and regularly update the plan; and (3) develop a cadre of teachers that are willing to experiment and provide the training and resources for its success. (LP)

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CASE STUDIES IN THE CURRENT USE OF TECHNOLOGY IN EDUCATION

Lead article in *Rural Research Report*
Summer 1995, Volume 6, Issue 10

By:

Robert F. Hall and Bruce O. Barker

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Case Studies in the Current Use of Technology in Education

by Robert F. Hall and Bruce O. Barker[1]

There are many factors that impact public education in rural areas, but the two most obvious are low student enrollment and geographical isolation of most rural schools. These two factors have created unique challenges for educators hoping to provide rural youth with educational opportunities equal to those offered to students living in urban or metropolitan areas and attending large school systems. Because of these factors, rural schools typically face the multiple challenges of (1) limited course offerings for students; (2) providing high quality staff development opportunities for teachers who are usually geographically isolated from professional counterparts in other schools; (3) recruiting and retaining qualified teachers; (4) equitable funding for student programs, teacher salaries, and capital improvements in comparison to urban and suburban districts; and (5) lack of specialized services (Cole, 1991; Jolly, 1993; Monk, 1989).

If rural schools in Illinois and other states are to continue to provide a quality education to their students, there are at least four issues that must be addressed by state government. These issues follow: (1) How can we provide adequate financial resources to rural schools? (2) How can we expand curricular offering in rural schools so that students are not at a disadvantage when compared to students from urban and suburban areas? (3) How can we provide access for students in rural schools to the "Information Superhighway"? (4) How can we provide job opportunities for rural students so that they do not have to migrate to urban and suburban areas to find gainful employment? Two of these issues—expansion of curricular offerings and access to the "Information Superhighway"—are the focus of this *Rural Research Report*.

Curricular Limitations in Rural Areas

One of the recurrent themes that staff members at the Illinois Institute for Rural Affairs have heard repeatedly in the *Mapping the Future of Your Schools* program is that citizens and teachers alike want their students to have expanded educational opportunities. In a study of 22 rural schools in a North Central Illinois county, the curricular disadvantages of small high schools have become very obvious. As an example, curricular offerings have been compared in English, foreign language, and mathematics in a Chicago suburban high school, a rural high school district, and a small rural unit district. The suburban high school enrolls approximately 2,500 students, the high school district enrolls 700 students, and the rural unit district high school enrolls 40 students.

While course offerings alone do not determine the quality of education that a child receives, it is obvious that children attending suburban schools in Illinois have a definite advantage over their rural counterparts. There are technologies available, such as interactive satellite education (e.g., one-way video and two-way audio), that allow rural districts to offer students access to courses that cannot otherwise be provided by the school district. Additionally, the development and installation of fiber-optic networks have the potential to allow districts to share teachers and, through the use of interactive television, increase course offerings to students. However, at the present time, many of the distance learning opportunities are cost-prohibitive for districts. If students in all areas of Illinois are to have equal access to educational opportunities, then resources must be found to enable the districts to enhance their educational programs.

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Table 1. Course Offering Comparison: Suburban High School, Rural High School District and Rural Unit District School

Foreign Languages

Suburban High School	Rural High School District	Rural Unit District School
French I, II, III, IV, V	German I, II, III, IV	Spanish I, II
German I, II, III, IV, V		Spanish I, II, III, IV
Italian I, II, III, IV, V		
Spanish I, II, III, IV, V		
Accelerated Program in Foreign Language (All Languages)		
Advanced Placement Spanish		

English

Suburban High School	Rural High School District	Rural Unit District School
English I	Basic English I, II, III	English I
English I Accelerated	Reading	English II
English I Remedial	English I, II, III, IV	English III
English II	Advanced Placement English	English IV
English II Accelerated	Media Communications	Life Skills
English II Remedial	Accelerated English I	
English III		
American Studies		
English III Accelerated		
English III Remedial		
English IV Advanced Placement		
English IV Remedial		
Composition		
American Literature		
Readings in American Studies		
English Literature		
World Literature		
Speech and Drama		
Oral Communications		
Drama I, II		
Broadcasting I, II		
Public Speaking		
Oral Interpretation		
Competitive Speech		
Debate		
Technical Theater		
History of the Theater		
Dramatic Literature		
Creative Drama		

Mathematics

Suburban High School	Rural High School District	Rural Unit District School
Fundamentals of Mathematics	General Math	Algebra I
Pre-Algebra	Vocational Math	Geometry
Introduction to Algebra	Business Math	Algebra II
Algebra I	Elementary Algebra A	Pre-Algebra I, II
Algebra II Freshman	Elementary Algebra B	Analysis
Accelerated Algebra II	Algebra I	
Applications of Mathematics Remedial	Geometry	
Sophomore Algebra	Algebra II	
Plane Geometry	Trigonometry	
Geometry	Analytic Geometry	
Accelerated Geometry and Trigonometry	Pre-Calculus	
Algebra II		
Advanced Algebra and Geometry		
College Algebra and Trigonometry		
Accelerated Math Analysis		
Mathematics and Technology		
Trigonometry		
College Algebra		
Pre-Calculus		
Advanced Placement Calculus (Analytic Geometry and Calculus)		

Table 1. Course Offering Comparison: Suburban High School, Rural High School District and Rural Unit District School, continued

Mathematics, continued		
Suburban High School	**Rural High School District**	**Rural Unit District School**
Calculus BC and Differential Equations		
Probability and Statistics		
Computer Science 1		
Computer Science 2		
Computer Science 3 Advanced Placement (Structured Programming using Pascal)		
Computer Science 4 Advanced Placement (Continuation of CS 3 AP)		

Rural Education Access to Technology

Advanced technologies are inundating all aspects of our society. Educational developments in computer-aided learning, CD-ROMs, multimedia, interactive video, telecommunications, and distance learning are increasingly impacting American classrooms. Nevertheless, the typical school classroom can still be characterized as following a 2 x 4 x 6 model — that is, instruction is focused on the content contained within two covers of a textbook, taught within four walls of a classroom, and separated by six evenly spaced instructional periods. According to the U.S. Office of Technology Assessment, typical school classrooms have changed little in either function or design over the past 50 years (U.S. Congress, 1988). As they always have, most teachers still stand in front of students, next to a chalkboard, chalk in hand as they lecture to the class. And, as they always have, a few students take notes; others look out the window or stare randomly about the room. However, with the integration of computer and telecommunications technologies into schools, the traditional classroom is facing its greatest challenge since the introduction of the chalkboard in the mid-19th century (Wilson, 1993).

Futurists predict that in the next 25 years there will be dramatic changes in the way Americans relate to their community and their country. A major impact will be seen in advanced developments in technology and in telecommunications. The so-called "Information Superhighways," now being formed, will make incomprehensibly vast amounts of information readily available to those who know how to access it. And, the key to information access will be held by those who know how to use technology to their benefit (McClaughry, 1993; Saffo, 1994). Information highways will make it cheaper and easier for information-based industries to relocate from large cities to small communities and rural areas. Information access will be largely independent of geographical location, resulting in direct educational benefits to rural schools and potentially offering economic benefits to rural communities.

New and developing instructional technologies will continue to bombard the educational marketplace. This is occurring at a time when some teachers are still trying to cope with the introduction of the microcomputer in the mid-1970s. The thought of incorporating laser disc technology, CD-ROMs, video text, electronic mail, telecommunications, video imaging, distance learning and the Internet must seem mind-boggling to many. Certainly, the challenge is not a simple one. Yet, if today's educators fail to integrate modern and evolving technology in American classrooms, the education provided in our schools will have limited meaning in the lives of students.

Reform and improvement efforts in American education begin with the premise that our schools, designed in the industrial age, do not meet the needs of today's information-based society. The task facing today's educators, whether they be urban or rural, is to prepare young people for their future, not our past. The U.S. Office of Technology Assessment's epic study, *Power On! New Technologies for Teaching and Learning*, suggests that the new tools of the information age can be pivotal in shaping the American classroom to fit and adapt to the ever-changing environment. Although new interactive technologies alone cannot solve the problems of American education, they have already contributed to important improvements in learning. These tools can play an even greater role in advancing the substance and process of education, both by helping children acquire basic skills and by endowing them with more sophisticated skills so they can acquire and apply knowledge over their lifetimes (U.S. Congress, 1988, p. 4).

This *Rural Research Report* focuses on how eight schools and one intermediate educational service unit are utilizing technology to improve educational opportunities for children. In some cases, the districts have been utilizing technology in one way or another for the past 15 years. The schools were identified by a survey of the technology consultants in Illinois Educational Service Centers (ESCs) which asked them to identify which schools were making effective use of technology. The schools that were chosen are not all rural but all have models in place that can be replicated in rural settings. In each case, we have identified the contact person for readers interested in obtaining additional information.

Kankakee School District #111

Kankakee School District #111 is located in Kankakee, Illinois, in Northeast Illinois about 40 miles south of Chicago and 18 miles from Indiana. The Kankakee school district is a K-12 district enrolling approximately 5,500 students. The district is composed of nine elementary schools, a junior high school, and a senior high school. While Kankakee is obviously not a rural district, the schools reported (Edison and Aroma Park) could easily be found in any rural setting. Edison and Aroma Park are both K-3 facilities that enroll 200-250 students. Aroma Park is in a rural setting.

Technology Resources. The initial reaction of the central office staff to being included in the survey was one of surprise, because they perceived themselves as needing to update their current technology. The reason for the need to update and probably why they were reported as a model school district is that they have been utilizing technology at the elementary level since 1978. In most cases, they began with Apple II computers and, in fact, still have several Apple labs that are effectively serving students. Both elementary buildings (Aroma Park and Edison) have at least one Apple lab (Apple II GS's at Edison and Apple IIe's at Aroma Park) and an IBM "Writing to Read" lab. The IBM labs were developed in 1992. Kankakee has developed several magnet schools, with Edison being a computer magnet school and Aroma Park being a math magnet school. Aroma Park currently has laser disc technology and is moving toward a developmentally appropriate learning curriculum.

Edison Elementary. Edison Elementary is the computer magnet school for the Kankakee district. During academic year 1994-1995 Edison students had the highest third grade IGAP scores in the district. When Edison was designated as a computer magnet school, the decision was made to implement LOGO on a school-wide basis, and extensive inservice was offered to teachers to successfully implement LOGO.

When they first began using computer labs, they purchased enough machines so that students could work two to a machine. They later expanded the labs to 28 computers so that each student had his/her own computer when they were in the computer lab. In the initial phases, there was an educational aide responsible for the lab, but, because of budget cutbacks, the position was later eliminated.

Aroma Park Elementary. Aroma Park is the math magnet school for K-3 in Kankakee. Through a science literacy grant, Aroma Park received a Macintosh computer, two laser disc players, a modem, a phone line including one year of paid fees, and a subscription to the National Geographic Kids Net. A teacher was trained on how to use the equipment and how to integrate Kids Net into the curriculum. The training and support were supplied by the ESC computer consultant. In third grade, one of the units on Kids Net that was completed was Acid Rain. In addition to Kids Net, the district utilized the Windows on Math and Windows on Science software.

Other software that is available to students and teachers at Aroma Park includes 3-D Atlas, Encyclopedia, Almanac, Claris Works, and Print Shop. The school currently uses a volunteer to help in the computer lab. At the present time, the principal of the building is experimenting with the use of an Apple Newton Personal Assistant to assist teachers with making daily assessments of children's work and with entering the information into a computer.

Future Directions. The district is currently investigating many different ways of acquiring new technologies. The district developed a five-year plan in 1992 with the assistance of EduQuest of the IBM Corporation, but implementation of the plan will depend on financing. Financing will continue to be a problem in the future. Aroma Park has been designated as a Chapter I school, and the monies available because of the designation will allow the district to network the entire building.

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Rock Island School District #41

Rock Island School District #41 is located in Rock Island, Illinois, across the river from Davenport, Iowa, and is part of the Quad Cities. The Rock Island School District is a K-12 district enrolling approximately 7,000. The district is composed of twelve elementary buildings, two junior high schools and one high school. This case study includes two elementary schools: (1) Horace Mann, a year-round school, that has been in operation for three years, and (2) Lincoln, which has been designated as a Chapter I school.

Technology Resources. Horace Mann was designed to have a technology core curriculum and the building was networked when it first became a year-round school. There are two Macintosh computers with a printer and CD-ROM per classroom. The building has a file server and a computer lab with 25 stations. There is a modem on the network, and teachers and students have access to the Internet. The school employs a half time aide who supervises the computer lab and works with teachers to integrate technology into the curriculum. Each classroom and teacher also have access to e-mail. The school has a computerized library and eventually, students will be able to access the library catalog from their rooms.

Lincoln is a Chapter I, K-6 school that has a focus on reading. This summer, they completed wiring of the building with Category 5 (High Speed) cable, with a fiber-optic link between the two buildings that make up Lincoln. They have installed two wiring closets; one shares space with the administrative computing hub which will eventually allow e-mail between teachers, students and the central office. The network will support either Macintosh or PC's. The file server for the building is a Mac 9150 with two one-gigabyte hard drives. The system runs Apple Share management software. Each classroom has three Macintosh LC 575 computers with CD-ROM's and a color Macintosh Powerbook 520c. All computers have a minimum of 12 megabytes of memory, 300 megabyte hard drives, and internal modems.

The school also has two labs, each with twelve stations. The labs are labeled HOTS Labs (Higher Order Thinking Skills) and several teachers were sent to Arizona to be trained on their use. The HOTS Labs are designed to work with at-risk students; students learn to problem-solve at the computer with no outside help.

Lincoln is using the management system At Ease which allows students to only see the programs the teachers want them to see and allows teachers to manage student accounts. Each student has his/her own password for the system. The school has also installed the Winnebago Library Management Software, and each classroom will have access to the library catalog.

Curricular Uses of Computer Technology. At Horace Mann, teachers use the classroom computers for word processing, or writing centers, and for research. The intermediate grades all have access to *Grolier's Encyclopedia* and the primary grades have access to *Compton's Encyclopedia*. The teachers at Horace Mann use the computer lab as an integrated part of the instructional process, which is built around thematic units. For example, if the thematic unit is art, the lab assistant will find appropriate software, (e.g., Kid Pix and Kid Works II) and the National Gallery of Art CD-ROM, and will assist the teacher in developing activities to support the unit.

At Lincoln, the teachers make use of Accelerated Reader software and books. The school purchased approximately 4,000 books to support the program, and students read the books and use the computer to take tests covering the material. The schools make use of WordPerfect to write stories and add graphics to illustrate them. The school also makes use of a Zap Shot camera to integrate graphics and pictures into the printed material.

Future Directions. The district currently has a Management Information System (MIS) committee in place that includes representatives from John Deere and Modern Woodman Insurance. The committee is focusing on the infrastructure with the aim of connecting the buildings to the network, which will eventually allow access to the Internet. The district maintains a strong commitment to technology and is currently developing a five-year plan for staffing in the area of technology.

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Teutopolis Unit District #50

Teutopolis Unit #50 is located in Teutopolis, Illinois, a town of approximately 3,000, in South Central Illinois. The Teutopolis district is a Pre K-12 district enrolling approximately 1,400 students. The district is composed of five buildings—three elementary, one elementary/junior high combination (Pre K-8), and a senior high school.

Technology Resources. For a small rural school, Teutopolis Unit #50 is remarkably well-equipped with computer technology. The district currently has three Novell Networks—one for administrative uses, one for the high school and one for the Pre K-8 school. The school district has over 200 IBM-compatible computers, primarily 386's and 486's. The high school of 405 students has three labs with twenty computers in each, six of which are multimedia computers and two mini-labs with six to ten computers. There are also ten computers in the study hall. In Teutopolis, a student can use any vacant computer if he/she will check with the teacher. All computers at the high school have access to the Internet.

At the Pre K-8 school, there are two labs; the elementary lab has 20 computers, and the junior high lab has 25 computers. Additionally, all fifth through eighth grade classrooms have networked multimedia computers on carts. These may be used individually or may be grouped together as a mini-lab. There are also two social studies mini-labs and three math mini-labs with four to five computers each. The district has been using computers in education for the past 15 years. One reminder of this fact is that the district has 35 Radio Shack computers that are still going strong and are used in the fifth and sixth grades for mathematics. At Teutopolis, even the lunch rooms are computerized, with students using credit cards to pay for their lunches.

One big advantage that Teutopolis enjoys is that they are a "node" for Net Illinois and this gives the high school access to the Internet from any computer. All schools in the Effingham area are able to access Net Illinois. Additionally, any individual who wishes to pay the subscription rate can, with a local call, access the Information Superhighway. This project was funded through a Rural Datafication Grant. The district has developed into a training center for the Internet, with teachers from all over the state attending workshops.

Curricular Uses. While computers are used in K-12 classrooms, keyboarding is taught at the junior high as part of a survey course on technology. The survey course also includes: desktop publishing with graphics, programming in Q-Basic, and instruction on how to conduct research using technology. The business department uses technology in typing and accounting and programming are taught using Q-Basic. Every department uses computers for different units and all departments use Internet and CD-ROMs for research. The high school has ten CD drawers that are menu driven which allow students to access information. For example, during the unit on the Civil War, a CD-ROM dealing with the Civil War is placed in the drawer for student access during the specified time. By student request, a CD can be made available at times other than during the unit.

The Social Studies department uses databases that students create and draw conclusions from, by analyzing the data they have developed. As an example, students will divide up the United States Presidents, enter data and come to conclusions based on their analysis of this data. The Industrial Technology department has a CAD lab with two computer-controlled machines—a lathe and a mold. In Physical Education, students keep track of their weight and what they eat, and this can help students gain or lose weight. One interesting point is that teacher evaluations in the district now include an evaluation of how they use technology in the classroom. When hiring, a candidate's computer ability is considered.

The district is also developing ways to use the computer as an alternative assessment tool that will aid them in the quality review process. The district has been offering classes to the public and, in one instance, has developed a workshop for secretaries at the courthouse on how to use WordPerfect.

Future Directions. The district recently completed the fifth year of a five-year plan for technology integration. A committee, composed of administrators, teachers, parents, and community leaders, is now in the process of developing a new plan with emphasis on philosophy and the future of computer technology and use in the district.

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Burlington Community High School, Iowa

Burlington High School (1,400 students) is located in Southwestern Iowa along the Mississippi River, directly adjacent to the Illinois border. The "Adventures in Supercomputing" program at Burlington High School provides students the opportunity to become involved in both technology and the world of scientific research. During the 1994-1995 school year, a total of 38 students participated in the program, bridging the gap between classroom learning activities and the real world of scientific research.

Supercomputing in Physics and Chemistry. A $50,000 grant from the U.S. Department of Energy and monies from an Eisenhower Math/Science grant have equipped the Science department at Burlington with sixteen Macintosh computers (LC IIs, LC IIIs, and 2VX machines). They have also paid for eight weeks of training for Burlington High School science teachers to learn to use Supercomputing software while attending summer sessions at Iowa State University.

The science lab has a direct connection to the Internet and a variety of advanced animation, FORTRAN, and science applications software programs which allow students access to vast scientific data bases at Iowa State University in Ames and around the world. Furthermore, advanced software programs allow students to create their own 3-D simulations and to exchange data with remote archives in a matter of minutes. As a result, the Supercomputing program allows students to simulate complex science experiments and to explore their own scientific simulations, enabling high school students to participate in complex science experiments that only a few years ago would have been solely in the domain of university research scientists.

Student Benefits of Participation in Supercomputing. Supercomputing has allowed students to produce and visualize complicated concepts like vectors, coordinates, reflections, refractions, ray tracing, climate fluctuations, fractals, FORTRAN programming, molecular viewing, gravity, and so on. Students also gain hands-on experience in accessing electronic bulletin boards, exchanging e-mail messages on the Internet, conducting Internet searches, making Internet file transfers, downloading picture and sound files, and opening and copying public domain software programs.

Students have created a home page using Netscape™ on the World Wide Web for Burlington High School's "Adventures in Supercomputing" project. The home page outlines the many detailed scientific simulations which class members have conducted. The home page address is http://198.247.53.2/homepage3.html.

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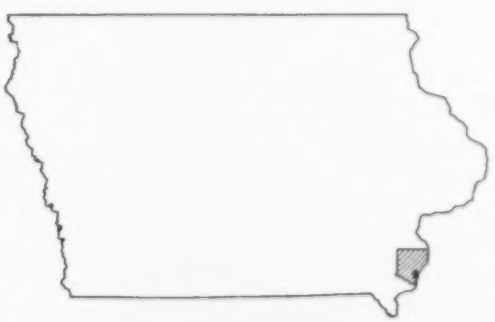

Erie Community Unit School District #1

Erie CUSD #1 is located in Erie, Illinois, in Northwestern Illinois, about 25 miles northeast of the Quad Cities. The Erie school district is a K-12 district that enrolls approximately 825 students. The district is composed of two elementary buildings, a junior high school, and a senior high school.

Technology Resources. The district has been actively involved with integrating technology into the curriculum since 1979. In 1989, the district networked all of the buildings, and the rural elementary building has e-mail access to town. The district is currently finishing a new high school building that will have two new Macintosh labs. The district is "recycling" the old Macintosh computers to a writing lab at the high school. There is also a Macintosh computer on every teacher's desk, and all teachers have access to e-mail.

Curricular Uses of Computer Technology. Erie Schools believe that they are in the "fourth phase" of utilizing computers in education in that technology is fully integrated into most curriculum areas. All students in the fifth through eighth grades receive computer instruction, which includes keyboarding, LOGO, word processing, databases and spreadsheets. In the eighth grade, they are introduced to HyperCard and HyperStudio.

As an example of how teachers are using technology, in the fourth grade, the teachers uses a "Zap Shot" camera to take pictures of students and their work which are then transferred to video tape and shown to parents. In social studies at the middle school, teachers use Civilization software in grades six and seven.

Future Directions. The most pressing concern for school officials is to get the new high school building technologically operational. Currently, there is no formal written plan for technology. If teachers are active users of technology, then more resources are given to them. The district realizes that any technology that is purchased is almost immediately obsolete but that valuable educational applications can be made using even "old" equipment.

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Cambridge Community School District #227

Cambridge Community School District #227 is located in West Central Illinois in the community of Cambridge (population 1,100). The district enrolls a total of about 700 students and operates one elementary school and a joint junior/senior high school.

Broadening High School Curriculum via Distance Learning. The high school enrolls just over 200 students in grades nine through twelve. With such a small pool of students, it has been difficult to offer a broad and varied curriculum. The problem was overcome when Cambridge administrators joined the Western Illinois University/Illinois State Board of Education (WIU/ISBE) Satellite Education Network. The use of interactive high school credit courses originating from the TI-IN Westcott Telecommunications network in Texas has played an important role in expanding educational opportunities offered to high school students. In fact, distance learning interactive satellite courses have enabled administrators to double their curricular offerings for less than the cost of one full-time teacher.

Over the past few years, several courses have been offered each year via TI-IN, with an average of 30 or more students taking classes each year. Popular courses include physics, marine biology, Japanese, French, Latin, psychology, and sociology. Even if the school could locate a Japanese teacher, they could hardly justify hiring a teacher for only one or two students who would enroll in the course. Satellite TV technology has made it possible for a small number of highly interested and motivated students to take low-incident courses which would otherwise not be available to them. For the 1995-1996 school year, the district will offer an array of advanced distance learning credit courses not offered in their traditional curriculum to more than 30 students at a cost of less than $20,000.

Advantages and Disadvantages of Satellite TV Courses. Students enrolled in satellite courses keep in touch with their teachers by watching live broadcasts daily and by speaking on the telephone and sending fax messages about once per week. Students indicate both advantages and disadvantages to this approach to learning. Definitely one advantage is the chance to take classes that help students prepare for college—classes which would not be offered at Cambridge otherwise. This has been true for students taking Japanese and Latin who want to meet college entrance foreign language requirements. Another advantage is that all classes are videotaped, thereby allowing students to review tapes or to view a tape at home if they missed class.

Students in the physics class note that they get to observe and participate in many experiments. Students in the marine biology course dissect a sponge, squid, crayfish, starfish, perch, shark, clams, and much more. All samples arrive after students enroll in the course and are vacuum sealed until students open them when they are needed for the class. Similarly, a physics "lab kit" is mailed to the school from TI-IN offices in San Antonio, Texas, for use by students in class. However, one drawback identified by students is that they must set up their own experiments. A classroom facilitator at Cambridge supervises students in each of the satellite courses to help direct them in their work, to distribute materials, to supervise tests, and to serve as a liaison with the TV teacher in San Antonio.

Another disadvantage is scheduling. Some classes begin at 7:00 a.m. and some air after school is out. Cambridge has no control over the schedule. Since more than 2,000 schools nationally subscribe to classes, one high school has little influence in requesting scheduling changes that might accommodate students locally.

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Christopher Community High School District #38

Christopher Community High School is located in Southern Illinois in the small town of Christopher (population 2,800) 50 miles north of the Kentucky border. The high school district operates two buildings on a single campus and enrolls a total of approximately 260 students in grades nine through twelve. The two buildings are connected via a fiber-optic link for the flow of electronic data between them.

Satellite-Based Distance Learning. In 1990, the district was named as one of the "Outstanding Rural Schools in the Nation" by the National Rural and Small Schools Consortium of the American Association of School Administrators. This honor was granted largely because of Christopher's pioneering membership and participation in the Western Illinois University/Illinois State Board of Education (WIU/ISBE) Satellite Education Network. In the past five years, approximately 10 percent of Christopher's students (an average of 25-30 students per year) have enrolled in high school credit distance learning courses offered by TI-IN Westcott Telecommunications. During the 1994-1995 academic year, a total of 27 students were enrolled in foreign language courses offered via satellite-delivered distance learning. As a result of satellite-based distance learning, the school curriculum has been able to include three years of Spanish, two years of German, two years of Latin, and two years of French.

The total cost to offer four languages as part of the school curriculum is approximately $15,000 to $18,000 per year, depending on the number of students enrolled. The total cost is incurred by the district. As part of this cost, the district also receives a broad array of staff development and teacher inservice programs offered via satellite delivery.

During the past several years, Christopher administrators have been tracking IGAP and ACT scores of students enrolled in distance learning classes. Students in distance education classes have been averaging two to three points higher than their peers in other classes.

Additional Technology Initiatives at Christopher Community High School. The high school currently operates three computer labs with an overall student/computer ratio of 1 computer for every 1.27 students. Labs are available in the Computer department, Business department, and Language Arts department, as well as in the library. Equipment in the labs include a mix of Macintosh LC III, Macintosh GS, and IBM 486 machines with CD-ROM drives. The computer curriculum includes four levels of concentration: (1) one semester of computer history; (2) one semester of computer concepts; (3) one semester of computer literacy; and (4) one full year of advanced computer applications. A new course planned for the computer curriculum will focus on how to access the Internet and the World Wide Web for information access and exchange.

In January 1995, the district received a $57,000 ISBE grant to connect 13 new work stations to the Internet and the World Wide Web. These will be used chiefly in the library and by social studies and language arts students. Furthermore, the school library was the first public school library in Southern Illinois to join the Shawnee Library System providing students and faculty with online access to library information and services.

The district has a long-term technology plan in place which calls for the continued upgrading of equipment and software/courseware for instructional purposes, as well as for connecting each classroom with the office for electronic recordkeeping. The long-term plan includes continued applications for distance learning, interactive multimedia, instructional video, computer labs, library automation and broader online services, classroom networking, and increased access to and use of the Internet.

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Great River Area Education Agency, Burlington, Iowa

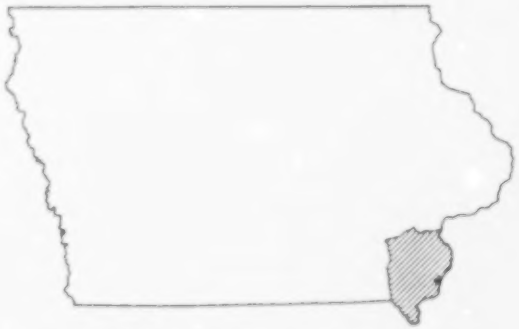
The Great River Area Education Agency (GRAEA) in Burlington, Iowa is one of fifteen education service agencies in Iowa. The GRAEA serves seventeen K-12 school districts in the southwestern region of the state. The service region includes about 2,000 administrators and teachers working in 70 different school buildings attended by about 20,000 students. Most of the schools in the region are rural, with student enrollment ranging from about 400 per school on the low end to as high as 5,000 on the high end.

Internet Training for Regional Teachers and Administrators. In Spring of 1994, the GRAEA arranged dial-up access to the Internet for one work station in each of the 70 schools in its service area. Access and use was provided via Iowa Network Services at a cost of $30 per school per month for a three-month period. Training was provided to teams composed of a media specialist and one teacher from each district in the region. Training provided by the GRAEA taught users how to log-in to the Internet, to use e-mail and gopher servers, and begin to do some initial "surfing" on the Net. After the one-day training sessions, participants were encouraged to continue surfing the Net and to begin e-mail exchanges among themselves.

A few months later in the summer of 1994, two weeks of training was offered at the GRAEA to interested teachers in the region's 70 schools who wanted in-depth training on the Net. In addition to e-mail, these teachers were taught how to subscribe to listservs, use conference online groups, access newsgroups, search gophers for specific information, begin using World Wide Web browsers, and so on. Following the training, these teachers returned to their schools to help train others to use the Internet.

Building the Infrastructure for Internet Connections to Area Schools. Following the initial charge of $30 per school per month to connect and access the Internet on a dial-up basis for a three month period, Iowa Network Services assessed a new charge of $.15 per minute of use. This increased cost significantly reduced schools' online use of the Internet and caused personnel at the GRAEA to begin looking at options to connect schools to the Internet. Each member of the professional staff at the GRAEA has direct connection to the Internet through the state's fiber-optic network which permits rapid access to the Internet's full range of services including text, images, sound, and motion files. In the next two to five years, the state hopes to connect each school to the Iowa Communications Network (ICN), which is the backbone of the state's fiber-optic system. Accordingly, the GRAEA is working with area schools to put in place the necessary infrastructure in each building that will permit schools full access to the Internet. Computers at individual schools will be connected to a local file server which is, in turn, linked to the server at the GRAEA. The GRAEA will serve as the point of connection to the Internet for each school in its region. The intent is to permit affordable full access to the Internet from each computer in area schools without the delay and slow speed inherent in modems and dial-up access.

Assisting Schools with Long-Term Technology Planning. To help bring area schools "up to speed" in the use of technology, staff at the GRAEA also provide long-term technology planning for school administrators and teachers. Teams of four to five players from each school (one administrator, the media specialist or computer coordinator, and several technology literate teachers) meet under the direction of GRAEA technology staff to conduct a self-assessment of technology resources at their local school and to identify needs for the future. The six-day training focuses on (1) program needs which include instructional applications for technology and administrative/management applications; (2) equipment/hardware—determining what is already in place and what needs to be acquired; (3) software and courseware currently available, as well as that which is desired; (4) staff development needs in order for staff to gain skills in using new technology and in adapting teaching styles to optimize the use of new tools and resources for learning; and (5) student achievement scores to assess the impact of new technologies on student learning.



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Harrisburg Community School District #3

Harrisburg Community School District is located in Harrisburg (population 9,300) in Southeastern Illinois, about 40 miles north of the Kentucky border and 25 miles west of Indiana. Harrisburg Community School District is a K-12 system enrolling approximately 2,600 students. The district is composed of two elementary schools, a junior high school, and a senior high school.

Technology Resources in District. The district maintains six computer labs—three in the high school, one in the junior high school, and one each at East Side Elementary and West Side Elementary schools. In addition, most teachers have machines in their classrooms, and each teacher is expected to enter student data and grade information on the district's automated recordkeeping system.

The district has been an active member of the Western Illinois University/Illinois State Board of Education (WIU/ISBE) Satellite Education Network since the network's inception in 1989. During the 1994-1995 academic year 21 high school students were enrolled in interactive satellite delivered distance education classes originating from TI-IN Westcott Telecommunications. These courses included astronomy, marine science, Latin II, and Japanese II. Furthermore, as part of the gifted curriculum, an additional ten fifth grade students at East Side Elementary, ten fifth grade students at West Side Elementary, and a total of one hundred second grade students were enrolled in the Spanish telecast from TI-IN which is offered three times per week.

In addition to TI-IN satellite programming, the district also subscribes to the Channel 1 network receiving twelve-minute news broadcasts, aired daily via closed-circuit TV throughout the district's classrooms. Other technology-based instructional resources include online library access to the Illinet library system, National Geographic for Kids via the Kids Network, and the Dynix automated library system. And, in January 1995, the District received a $7,500 ISBE grant to establish one computer work station at each of the district's four schools to connect to the Internet and World Wide Web.

Instructional Video and Broadcast at East Side Elementary. In 1992, the district received a $15,000 grant from GTE North as part of GTE's Pioneering Partners program. The grant provided funding to enhance a locally aired TV news program produced and broadcast daily by fourth grade students at East Side Elementary school. The daily student newscast is a blend of national and international news, sports, weather, entertainment, and consumer information. Most of the raw material for each day's newscast is gathered via modem from a local cable TV company. Student reporters gather local weather information from Station WPSD in Paducah, Kentucky. Other students at the elementary school submit artwork, letters to the editor, and other material to be considered for inclusion in the newscast.

After students have researched the day's news, they compose scripts on computers and rehearse prior to delivery on camera. Students take turns serving as TV anchors, program producers, and equipment operators behind the camera. In addition to airing daily throughout the school, the newscast is redistributed via the local cable access channel twice each week so that parents and community residents can watch the student-produced news program in their own homes.

Two-Way Interactive Televised Distance Learning. Beginning in the fall of 1995, Harrisburg Community School District will join the Southern Illinois Collegiate Common Market Consortium to link with Southeastern Illinois College, Southern Illinois University at Carbondale, Rend Lake College, Shawnee Community College, and other area institutions, including selected high schools, for receipt and exchange of two-way instructional programming. An initial plan is for Harrisburg High School and Eldorado High School, about ten miles to the northeast, to share a Spanish teacher via two-way TV distance delivery.

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Summary and Recommendations

If there was one common denominator in all of the schools that we investigated, it was that there was usually an individual who was the driving force behind the technology integration into the educational process. Quite often that person was an administrator in the district. He/she was not always a technology expert. In one school, a band director developed an interest in cataloging his music using a computer which led to his taking several courses in computer programming. He is now the computer coordinator for the district. In another instance, an English teacher was an early innovator because of her interests, and she is now the computer coordinator for her district.

In most schools, there was no technology plan in place. It would appear that schools tend to "wing it" when adopting technology and probably rely too much on the in-house experts. There is a need for schools to systematically approach the process of technology integration into the curriculum. There is also a need for schools to try to evaluate the impact of technology on education. In most instances, the only evaluation was anecdotal in nature (i.e., all students are using word processing, the teachers' attitudes are positive, and so on). With the current restructuring of Regional Offices of Education and the demise of the ESCs, there may not be resources available through intermediate agencies to assist schools in implementing and evaluating technology.

If there was one common mistake that was mentioned, it was that, frequently, hardware was purchased with no thought as to how to use the technology. One school reported that they assumed the inservice training would follow the purchase, and this did not happen. The advice offered by school leaders follows:

- Go slow, be selective, decide what you want and how best to get there.
- Look around at what other schools are doing, and do your best not to reinvent the wheel—ask schools what they did wrong, and try to avoid the same mistakes.
- Do not try to treat all teachers the same. Identify the "high fliers," give them access to equipment and software and do your best to insure their success.
- Find innovative ways to use old computer equipment. There are many applications such as in writing labs that do not require state of the art equipment.
- Be sure to secure the commitment of the board and administrative team.

The authors would propose that schools follow a three-step process in implementing technology: (1) conduct a district technology needs assessment that focuses on current practice and what is desired practice; (2) develop a technology implementation plan and regularly update the plan; and (3) develop a cadre of teachers that are willing to experiment and provide them the training and resources that will allow them to succeed.

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